

# **Business Cycles in Turkey and European Union Countries: A Perspective to the Membership**

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## **Türkiye’de ve Avrupa Birliği’nde İş Döngüsü: Üyeliğe Yönelik Bir Bakış Açısı**

### **Abstract**

This article assesses how the business cycles in Turkey coincide with the business cycles of member and candidate countries of the European Union. The evidence provided in the paper suggests that there is a negative linkage between Turkish and European business cycle dynamics when the Turkish crises are included in the data sets. This implies that the timing of the common economic policies of the European Union in order to decrease the volatility of output may actually increase the output volatility, rather than to decrease, for Turkey. On the other hand, when only the non-crisis data of Turkey is employed, a pro-cyclical linkage is revealed between Turkish and the European economies. This suggests that policies enhancing the macroeconomic stability and preventing crises are crucial for healthier synchronization of the Turkish economy with its EU counterparts.

**Key Words:** Business Cycles, Economic Integration, and European Union

**JEL Classification Codes:** E32, E23, F42

### **Özet**

Bu çalışmada Türkiye’deki iş döngüsünün; Avrupa Birliği’ne aday ve üye ülkelerdeki iş döngüleriyle benzer noktaları tayin edilmeye çalışılacaktır. Bu çalışmadan sağlanan sonuç; Türkiye’deki krizler verilere dahil edildiğinde Türkiye ve Avrupa’daki iş döngülerinin dinamikleri arasında negatif bir bağlantı olduğudur. Bu husus Avrupa Birliği’nde çıktındaki volatilitiyi azaltmaya yönelik uygulanan genel ekonomi politikalarının zamanlamalarının Türkiye için volatilitiyi azaltmaktansa arttırabileceğini ortaya koymaktadır. Diğer taraftan; Türkiye için sadece kriz dışı veriler ele alındığında, Türkiye ve Avrupa ekonomilerindeki iş döngüleri arasında pozitif bağlantı görülmektedir. Buradan anlaşılmaktadır ki, makroekonomik istikrarı sağlayan ve krizleri engelleyen politikalar Türkiye Ekonomisi ve Avrupa Birliği’ndeki paydaşları arasında daha sağlıklı senkronizasyon sağlamak açısından hayati önem taşımaktadır.

**Anahtar Sözcükler:** İş Döngüsü, Ekonomik Bütünleşme ve Avrupa Birliği

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## **1. Introduction**

On December 13, 2002 Turkey made a big step on its way to become a full member of the European Union (EU) nearly 40 years after its initial application. The Copenhagen European Council indicated that negotiations would start promptly if Turkey fulfills the political criteria set at Copenhagen in 1993. Recently, Turkey is closer to full membership than ever. Nevertheless, one can always be skeptical about the equivalence of 'full membership of the Union' and 'integration in all of the political, cultural, social, and economic fields'. These two may not be directly equivalent because the EU and Turkey have different economic characteristics. On the other hand, integration of Turkey to the EU is an important problem as compared to the cases of other candidate countries due to its large population, economic structure, different culture and religion. Each of these factors represents an important aspect of the problem-at-large. Consequently, the integration of Turkey to the EU has to be studied in terms of its economic and social dimensions.

In this study, we elaborate on the questions regarding the economic integration of Turkey with the Union among the potential questions mentioned above. This object of analysis is highly important because Turkey will be one of the biggest countries in the Union, owing to its high population, in the case of full membership. Moreover, the Turkish economy currently has big problems to be solved. For instance, high debt-to-GDP ratio and debt sustainability problems are the headline factors affecting the economic performance. Although Turkey has achieved historically lower rates of inflation and lowered the interest rates recently, there is still much to do within the framework of the last IMF sponsored program to stabilize the economy. In the paper, we examined the direction of the relationship between the industrial productions of Turkey and members of the EU in order to assess the effects of economic integration possibility of Turkey with the Union in the short-term.

The use of industrial productions rather than gross domestic products while assessing the relationship between the macroeconomic performances of Turkey and the EU countries is basically determined by the availability of data. Since the GDP data do not exist at monthly frequency, industrial production series is preferred due to the common observation that industrial production and the gross domestic product series are generally in conformity with each other. Therefore, use of industrial production, as a proxy of the gross domestic product would not induce severe biases. Given that we can obtain data only for the period after 1986, industrial production series provide us with as many observations as possible.

In the paper, we particularly report the cross-correlations of cyclical component of their industrial productions.<sup>1</sup> The basic evidence is that Turkey and EU countries have different economic dynamics. However, when the samples are adjusted to exclude the crises of Turkey, these dynamics turn out to be more synchronized. This sensitivity of our results to the exclusion of crises suggests that macroeconomic stabilization and crisis prevention policies in Turkey may contribute to Turkish economy to have better adaptation to its European counterparts

In the next section, we provide a short history of Turkey-EU relationship, elaborate on the political and economic criteria for membership and address the potential effects of Turkey on the EU budget. Third section elaborates on the methodology we have employed.

*1 - Berument, Malatyali and Neyapti (2001) look at the possible long-run synchronization of the Turkish and EU countries output and they could not find this relationship. However, this paper looks at the possible short-run synchronization of the Turkish and EU countries output*

Before concluding the paper, the empirical evidence is reported and findings are discussed in section four.

## 2. The Relationship between the European Union and Turkey<sup>2</sup>

### 2.1. Milestones of the EU-Turkey Relationship

The history of the relationship between the EU, the name of the union was European Economic Community (EEC) at that time, and Turkey dates back to the Ankara Agreement, signed on September 12, 1963. The Agreement was put into effect on December 1, 1964, and the Customs Agreement and the first Financial Protocol were established. The second and the third Financial Protocols followed the Ankara Agreement on November 23, 1970 and May 12, 1977. The fourth financial protocol was signed in 1980 yet the EU stagnated its relationship with Turkey after the military intervention of September 12, 1980. For the final stage of the Customs Union, the Turkish-EU Membership Council decided to extend the political dialogue and cooperation in various directions. This decision was taken on March 6, 1995, and then on December 13, 1995, the decision to finalize the Customs Agreement with Turkey was taken by the European Parliament. On January 1, 1996, the final stage of the Customs Union was completed.

Before the inclusion of Turkey to the MEDA Program of the EU, (MEDA stands for “Financial and Technical Measures to Accompany the Reform of Economic and Social Structures in the framework of Euro-Mediterranean Partnership” and it is designated for non-member countries) Turkey could not receive the financial aid that she was supposed to, because of the vetoes within the EU. Turkey acquired the right for the financial aid from the EU during 1996-1999 period and benefited from the resources provided to the MEDA countries, which worth 375 million ecu. On September 19, 1996, the European Parliament decided that the financial aids available to Turkey, except for the funds available within the MEDA Program, would not be available anymore. On March 18, 1998, some proposals for Turkey's progression to the EU with respect to various sectors and for extending the Customs Union to cover the agricultural sectors and services were published by the European Commission in the Agenda 2000. During the convention of Luxembourg European Council in December 1997, it was agreed that Turkey was eligible to join the EU. In addition, the need to determine a strategy for Turkey's progression to the EU in every respect was declared. However, Turkey argued that the decision was discriminating against Turkey as compared to the cases of other applicants and declared that it will discontinue its political dialogue with the Union.

The document entitled “European Strategy for Turkey” was published based on the agreement during the Luxembourg meetings. According to the former agreements as well as in this publication, the conditions that Turkey should meet for membership were spelled out. The approval of strategy for Turkey was indicated in the Executive Summary of the Cardiff Summit held on June 15-16, 1998.

An important result of the decisions taken at the Cardiff Summit was the inclusion of Turkey in the system of reporting that has to be followed also by other countries. Then, the EU published the first report about the performance of Turkey with respect to the Copenhagen Criteria on November 4, 1998. On October 13, 1999, the second report was

2- General information that we present in this section is compiled from Berument, Malatyali and Neyapti (2001), The Secretariat General for the EU Affairs, accessible at <http://www.euturkey.org.tr>, and EU resources on the World Wide Web. In addition, we have benefited from the personal computations of Sener (2003), which are not publicly available. Sahin (1998) and TOBBTAB are the other information sources employed here.

published. The monthly reports on Turkey along with the reports on other candidates were highly important since those reports played an essential role in Helsinki Meetings, which were held in 1999, where the progression to candidacy of Turkey was approved.

One of the most important cornerstones for Turkey was the report published after the EU meetings in Strasbourg on October 13, 1999. That report had favorable remarks and asked for Turkey's progression to candidacy. However, Turkey kept a cautious approach toward this report until the Helsinki Summit. On the Commission's 2000 Regular Report on Turkey's progress towards accession stated that the debate on the political reforms needed for the country's accession to the EU has already commenced. Although Turkey still did not meet the Copenhagen political criteria fully, it has begun to adapt a number of international human rights instruments and accepted the work of the Supreme Board of Coordination for Human Rights. Before the elections on November 3, 2002, the Turkish Grand National Assembly legislated a number of laws for adaptation to the Copenhagen criteria and the new government further accelerated this process. The year 2002 marked a historical turning point in the EU's enlargement. On October 24 and 25, the Brussels European Council approved the conclusions and recommendations set out in the package, which was adopted by the Commission on October 9, 2002. The Commission adopted an enlargement package comprising a strategy paper and, for each candidate country, a regular report on progress towards accession. Then, on December 12-13, 2002, the Copenhagen European Council, taking its cue from these recommendations, concluded accession negotiations with ten countries and decided that the accession of these countries would take place in 2004, except that of Bulgaria and Romania would be in 2007. For the case of Turkey, the European Council indicated that the negotiations with Turkey would be opened without further delay depending upon Turkey's fulfillment of Copenhagen political criteria as of December 2004 based on a Commission report and recommendation (See General Report, 2002- Chapter V: Enlargement).

## **2.2. Membership Criteria in Brief**

The European Commission declared the criteria for the EU membership at the end of the Copenhagen meetings held on June 21-22, 1993. The countries have been referred to as the “associate countries” under the “Central and East European Countries” section. Another decision, which was also stated in the declaration, was that if the countries in this group wish to join the EU they should meet the economic and political conditions set forward by the Union.

Reaching institutional stability that could secure the capacity for the dominance of democracy and law, human rights, minority rights, well-functioning market economy, and the competitive pressures emanating from the market forces within the Union are conditions that were expressed in the same section of the document. Moreover, the limitations for the acceptance of membership have been stated. It was also written that in order for a country to be accepted as a member, its membership should be beneficial for both the EU and that country.

The extents of the relationship with Turkey were presented, based on the agreement of 1964 and the protocol of 1970, in another section of the same document entitled “Relations with Turkey”. In the expansion policies of the EU, the Central and East European countries have an important role. This can also be deduced from the expressions in Copenhagen

Declaration. In order for these countries to be full EU members, they should meet specific criteria. However, the Union reserves its right for final word to accept or not to accept countries in order to protect itself from unexpected demands and developments. In addition to this, there are some flexible expressions and lines not drawn with regard to economic and political requirements of the Copenhagen criteria. These expressions leave a room for subjectivity in decisions.

As far as the requirements for a European Monetary Union (EMU) member is considered, each member has to delegate monetary policy authority to the European Central Bank (ECB), in that none of the members will be independent in adjusting its monetary policy by just considering its domestic circumstances. Malatyali (1998) states that due to the strict nature of the membership criteria, it is likely that the EMU will be realized at later stages of progression to the EU membership. A strengthening observation for this argument is that three of the fifteen EU members have not yet been members of the EMU, as of January 1, 2002.

### **2.3. Mutual Financial Responsibilities of the European Union and Turkey under Full Membership**

Financial support for the candidate countries is provided by the EU unless it creates excessive burden on the common budget. The financial aids are not only provided before the full membership of a country, but also they are expected to continue after. The total amount of expected financial support for the ten countries that have applied for candidacy - mostly the Central and East European countries - was 74.8 billion euros between 2000 and 2006 (Berument, Malatyali and Neyapti, 2001).

On March 18, 1998, the Brussels European Commission published Agenda 2000, in which the coverage of financial support to the countries prior to their full membership was defined. It includes agriculture, structural policies, and the PHARE program, through which technical and financial support is provided for both the candidate and non-candidate countries as part of the EU enlargement process. The provision of the PHARE program to the candidate countries necessitates the purpose of restructuring the administrative and legislative systems and use of it for investment. Moreover, it is stated in the document that there will be financial support for both projects designated to promote agricultural efficiency, and development and resource flow to environmental and transportation sectors. The maximum amount of available resources for the candidate countries will be 3 billion euros during the period from 2000 to 2006.

Turkey was approved to become a candidate in Helsinki Summit; therefore, she will also be eligible for receiving financial support as declared in Agenda 2000. The restructuring attempts in various sectors and areas could be strengthened by this support. Thus, the discussion of the financial relations between Turkey and the Union is an important issue.

In Table 1, the financial relations between the EU and Turkey can be seen and it is clear that Turkey could not benefit from the EU's commitments stated in the Financial Declaration of March 6, 1995 for the period of 1995-1999. According to the data for the end of 1999, Turkey could get only one-third of the total aids and grants listed in Table 1. Rest of them was either inactivated or vetoed due to political conflicts. However, those financial aids were very important for Turkey to improve her economy and to conform to the EU

standards. Turkey's position, as being a member of the Customs Union but not being a member of the EU, caused a number of difficulties in using credits from the Union.

**Table 1**  
**Status of the Relations between the European Union and Turkey: 1995-1999.**

Aid		Amount (in millions of euros)	Realization
Commission Grant		375	Vetoed by Greece
Renovated Mediterranean Policy		400	339.5
European Investment Bank-Special Credit		750	Inactivated
Euro-Mediterranean Partnership Program	Advance	376,4	MEDA:376.4 prohibited by the EU
	Credit	700	EUROMED: 205, totally disbursed
Macroeconomic Adjustment Aid		200	An option in cases of emergency only
<b>Total</b>		<b>2800</b>	<b>920.9</b>

Source: Sener (2003), personal computations

It is a useful exercise to examine the budgets of Turkey and the EU, if Turkey becomes a full member, by taking into consideration the difficulties that Turkey has faced with flow of relatively small amounts of funds during the non-membership phase. When Turkey becomes a full member, she will have obligations toward the Union budget, and will be able to use funds. For instance, member countries support the EU budget by customs tax, which is an obligation of being a member of Customs Union. Member countries provide part of their revenues obtained by imports from other countries to the common budget. They also contribute to the budget from their agricultural commerce with the third parties. Union budget receives some amount of taxes levied on these transactions. A third way of Union to obtain money is the funds coming from sugar production and storage. Fourth, member countries devote some of their Value-Added Taxes, and a specified proportion of their GDPs, agreed in 1988, to the budget.

Transfers to member countries occur through various funds, a non-exhaustive list of which is provided here. For example, European Agricultural Guidance and Guarantee Fund (EAGGF) Guarantee Section was founded to contribute to the restructuring of agricultural markets in member countries and to support the agricultural exports, storage, and acquisitions of goods. Purpose of structural funds is to reduce the differences in the level of economic and social development between member countries. By use of these funds, the efficiency of the financial resource allocation is increased. EAGGF-Guidance Section aims to develop agricultural production by settling stability and protecting both the consumers and the producers. The objective of the European Regional Development Fund (ERDF) is to achieve development in the countries that are relatively less developed. Another fund is the European Social Fund (ESF), which aims to generate employment and to improve living standards. Countries use this fund for payments of occupational retraining, relocation compensations, and unemployment insurance. The last one is the Adjustment Fund. Basic purposes of this fund are to finance environmental and transportation infrastructure projects and to improve the social adjustment of member countries.

In Table 2, the effects of Turkey on the budget of the EU in case of the hypothetical full-membership are illustrated (Sahin, 1998, p.118). The inflows to and the outflows from Turkey presented in the table covers the transfers described above, based on 1997 data. If we look at the table, we see that Turkey will have a net benefit of, at most, 8.3 billion ecu. As net resource transfers, Greece, who became a full member in 1981, received 34.7 billion ecu until 1997, Spain received 27 billion ecu between 1986 and 1997, and Portugal received 15.1 billion ecu in the same period as that of Spain. The related calculations for Turkey are done with the static conditions of 1997 with a restructured agricultural sector and, therefore, they may imply higher transfers of funds than actual ones. Thus, it is obvious that in case of full membership of Turkey, it will receive higher transfers than other candidate countries. The transfers from the EU would be continuing until the Turkish economy is fully restructured; hence, Turkey will bring a big financial burden on the EU budget. To compare with other candidate countries, net transfers to ten Central and East European countries worth about 10 to 12 billion euros where expected transfers to Turkey amounts to nearly 8 billion.

**Table 2**  
**The Effects of Turkey's Full Membership on the EU Budget (in millions of euros)**

<b>Turkey's contribution to the EU budget</b>	
Customs tax	550
Agricultural tax	30
Sugar and glucose tax	100
Value-added tax	1,050
GNP contribution	2,100
<b>Total</b>	<b>3,830</b>
<b>Turkey's potential benefits from the EU budget</b>	
EAGGF-Guarantee Section	6,400
Structural Funds	5,750
EAGGF-Guidance Section	1,200
ERDF	2,300
ESF	750
Adjustment Fund	1,500
<b>Total</b>	<b>12,150</b>

Source: Sahin (1998), p.118. The amounts presented in the table are based on 1997 data and derived by assuming full-membership of Turkey to the EU

During the 5th Enlargement Process, the development gap especially between the new member states and the member states has been a key factor while designing new regional political instruments. These instruments are also used for some of the member countries to let them integrate more with the other members in both economic and political aspects. With regard to this, the EU allocated a total of 260 billion euro to the structural innovations in either member or candidate countries. For instance, Greece will get 21 billion euro (286 euro per capita), Ireland will get 4 billion euro (121 euro per capita), Portugal will get 20 billion euro (285 euro per capita) and Spain will get 44 billion euro (155 euro per capita) annually.

The ten candidate countries (Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) will receive funds for structural development and integration to the EU within the framework of the PHARE, SAPARD, and ISPA programs. From the year of 2000 to 2006, these countries are to receive around 1,560 million euro through PHARE, 520 million euro through SAPARD, and 1,040 million euro through ISPA, which accounts to 7,280 million euro per year, in total.<sup>3</sup> On the other hand, the fund that allocated for Turkey for the same period is about 180 million euro (2.8 euro per capita) per year.<sup>4</sup> It should be noted that the same figure was 90 million euro per year, between the years 1996 and 1999. All in all, since the funds channeled to Turkey are gathered under one umbrella after the Helsinki Summit, these amounts display the total funds available for Turkey.

<sup>3</sup> - European Commission's Enlargement Information Centre.

<sup>4</sup> - "EU Regional Policies and Structural Funds: An Evaluation of the Case of Turkey", (AB Bölgesel Politikası ve Yapısal Fonlar: Türkiye Açısından Değerlendirme) TOBB7AB Directorate, 2003.

**Table 3**  
Cross Correlations with Industrial Productions of Turkey and Other Countries.\*

COUNTRY/REGION	PERIOD	St. Dv.*	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	
(UNITED STATES)	01/85-02/03	6.8	<b>-27</b>	<b>-24</b>	<b>-20</b>	<b>-16</b>	<b>-13</b>	<b>-9</b>	<b>-5</b>	<b>-1</b>	<b>5</b>	<b>11</b>	<b>15</b>	<b>19</b>	<b>23</b>	<b>25</b>	<b>24</b>	<b>24</b>	<b>23</b>	<b>23</b>	<b>24</b>	<b>25</b>	<b>24</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>25</b>
(JAPAN)	01/85-02/03	6.8	<b>6</b>	<b>7</b>	<b>8</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>13</b>	<b>15</b>	<b>15</b>	<b>16</b>	<b>16</b>	<b>18</b>	<b>16</b>	<b>15</b>	<b>11</b>	<b>9</b>	<b>5</b>	<b>2</b>	<b>-2</b>	<b>-4</b>	<b>-6</b>	<b>-7</b>	<b>-7</b>	<b>-7</b>	<b>-7</b>
BELGIUM	01/85-12/02	6.8	<b>12</b>	<b>8</b>	<b>11</b>	<b>7</b>	<b>6</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>8</b>	<b>5</b>	<b>12</b>	<b>12</b>	<b>6</b>	<b>5</b>	<b>-3</b>	<b>-2</b>	<b>-2</b>	<b>-5</b>	<b>-6</b>	<b>-6</b>	<b>-9</b>	<b>-11</b>	<b>-5</b>	<b>-11</b>	<b>-11</b>
(IND. COUNTRIES)	01/85-02/03	6.8	<b>-10</b>	<b>-9</b>	<b>-9</b>	<b>-7</b>	<b>-6</b>	<b>-5</b>	<b>-4</b>	<b>-2</b>	<b>1</b>	<b>4</b>	<b>6</b>	<b>8</b>	<b>11</b>	<b>11</b>	<b>11</b>	<b>9</b>	<b>8</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
PORTUGAL	01/85-06/02	6.9	<b>-8</b>	<b>-9</b>	<b>-9</b>	<b>-4</b>	<b>-1</b>	<b>2</b>	<b>5</b>	<b>9</b>	<b>15</b>	<b>16</b>	<b>14</b>	<b>12</b>	<b>11</b>	<b>12</b>	<b>15</b>	<b>18</b>	<b>19</b>	<b>19</b>	<b>16</b>	<b>18</b>	<b>22</b>	<b>22</b>	<b>19</b>	<b>15</b>	<b>13</b>	<b>13</b>
(NORWAY)	01/85-02/03	6.8	<b>6</b>	<b>7</b>	<b>4</b>	<b>6</b>	<b>5</b>	<b>7</b>	<b>11</b>	<b>10</b>	<b>8</b>	<b>10</b>	<b>9</b>	<b>8</b>	<b>3</b>	<b>-1</b>	<b>-7</b>	<b>-14</b>	<b>-13</b>	<b>-7</b>	<b>-1</b>	<b>-4</b>	<b>-5</b>	<b>-2</b>	<b>-8</b>	<b>-3</b>	<b>-3</b>	<b>-3</b>
SLOVAKIA	01/92-10/02	8.8	<b>30</b>	<b>26</b>	<b>23</b>	<b>22</b>	<b>20</b>	<b>17</b>	<b>14</b>	<b>10</b>	<b>7</b>	<b>4</b>	<b>3</b>	<b>-1</b>	<b>-2</b>	<b>-4</b>	<b>-3</b>	<b>-1</b>	<b>-3</b>	<b>-5</b>	<b>-9</b>	<b>-14</b>	<b>-21</b>	<b>-27</b>	<b>-32</b>	<b>-40</b>	<b>-40</b>	<b>-40</b>
FINLAND	01/85-02/03	6.8	<b>-32</b>	<b>-32</b>	<b>-32</b>	<b>-30</b>	<b>-29</b>	<b>-26</b>	<b>-23</b>	<b>-21</b>	<b>-17</b>	<b>-14</b>	<b>-9</b>	<b>-4</b>	<b>-2</b>	<b>-3</b>	<b>-5</b>	<b>-7</b>	<b>-8</b>	<b>-7</b>	<b>-6</b>	<b>-3</b>	<b>-2</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>2</b>
GREECE	01/85-04/02	6.9	<b>-7</b>	<b>-8</b>	<b>-6</b>	<b>-8</b>	<b>-8</b>	<b>-2</b>	<b>-5</b>	<b>0</b>	<b>0</b>	<b>-2</b>	<b>-5</b>	<b>-5</b>	<b>-3</b>	<b>-1</b>	<b>0</b>	<b>-5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>-1</b>	<b>-10</b>	<b>-11</b>
THE NETHERLANDS	01/85-02/03	6.8	<b>5</b>	<b>10</b>	<b>7</b>	<b>5</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>-2</b>	<b>-4</b>	<b>-4</b>	<b>0</b>	<b>-1</b>	<b>-3</b>	<b>-4</b>	<b>-1</b>	<b>-3</b>	<b>-4</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>0</b>	<b>-2</b>	<b>-5</b>
ITALY	01/85-04/02	6.8	<b>9</b>	<b>9</b>	<b>6</b>	<b>7</b>	<b>6</b>	<b>6</b>	<b>4</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>-3</b>	<b>-5</b>	<b>-3</b>	<b>-5</b>	<b>-4</b>	<b>-5</b>	<b>-13</b>	<b>-11</b>	<b>-14</b>	<b>-15</b>	<b>-17</b>	<b>-14</b>	<b>-13</b>	<b>-13</b>	<b>-13</b>	<b>-13</b>
SPAIN	01/85-12/02	6.8	<b>4</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>-2</b>	<b>-1</b>	<b>-2</b>	<b>-3</b>	<b>-5</b>	<b>-5</b>	<b>-5</b>	<b>-7</b>	<b>-8</b>	<b>-6</b>	<b>-9</b>	<b>-9</b>	<b>-9</b>	<b>-9</b>	<b>-7</b>	<b>-5</b>	<b>-1</b>	<b>1</b>	<b>3</b>	<b>6</b>
CZECH REPUBLIC	01/92-02/03	8.3	<b>45</b>	<b>43</b>	<b>39</b>	<b>32</b>	<b>26</b>	<b>19</b>	<b>13</b>	<b>9</b>	<b>5</b>	<b>1</b>	<b>-2</b>	<b>-6</b>	<b>-6</b>	<b>-8</b>	<b>-8</b>	<b>-9</b>	<b>-10</b>	<b>-10</b>	<b>-11</b>	<b>-11</b>	<b>-11</b>	<b>-11</b>	<b>-12</b>	<b>-15</b>	<b>-17</b>	<b>-19</b>
AUSTRIA	01/85-02/03	6.8	<b>-9</b>	<b>-6</b>	<b>-11</b>	<b>-12</b>	<b>-11</b>	<b>-13</b>	<b>-12</b>	<b>-13</b>	<b>-14</b>	<b>-10</b>	<b>-10</b>	<b>-9</b>	<b>-8</b>	<b>-9</b>	<b>-13</b>	<b>-13</b>	<b>-17</b>	<b>-21</b>	<b>-25</b>	<b>-29</b>	<b>-29</b>	<b>-26</b>	<b>-22</b>	<b>-17</b>	<b>-10</b>	<b>-10</b>
FRANCE	01/85-01/03	6.8	<b>0</b>	<b>-2</b>	<b>-4</b>	<b>-5</b>	<b>-7</b>	<b>-9</b>	<b>-11</b>	<b>-12</b>	<b>-11</b>	<b>-10</b>	<b>-8</b>	<b>-9</b>	<b>-8</b>	<b>-8</b>	<b>-8</b>	<b>-6</b>	<b>-4</b>	<b>-1</b>	<b>1</b>	<b>3</b>	<b>6</b>	<b>8</b>	<b>10</b>	<b>13</b>	<b>12</b>	<b>12</b>
(CANADA)	01/85-01/03	6.8	<b>-32</b>	<b>-31</b>	<b>-30</b>	<b>-31</b>	<b>-30</b>	<b>-28</b>	<b>-25</b>	<b>-23</b>	<b>-19</b>	<b>-17</b>	<b>-15</b>	<b>-12</b>	<b>-9</b>	<b>-6</b>	<b>-6</b>	<b>-6</b>	<b>-6</b>	<b>-6</b>	<b>-6</b>	<b>-5</b>	<b>-5</b>	<b>-3</b>	<b>0</b>	<b>2</b>	<b>6</b>	<b>9</b>
LUXEMBOURG	01/85-04/02	6.8	<b>-18</b>	<b>-16</b>	<b>-14</b>	<b>-17</b>	<b>-16</b>	<b>-22</b>	<b>-26</b>	<b>-25</b>	<b>-28</b>	<b>-23</b>	<b>-22</b>	<b>-16</b>	<b>-9</b>	<b>-4</b>	<b>-1</b>	<b>0</b>	<b>1</b>	<b>-2</b>	<b>3</b>	<b>6</b>	<b>9</b>	<b>13</b>	<b>10</b>	<b>12</b>	<b>12</b>	<b>12</b>
UNITED KINGDOM	01/85-01/03	6.8	<b>-21</b>	<b>-22</b>	<b>-24</b>	<b>-23</b>	<b>-23</b>	<b>-22</b>	<b>-22</b>	<b>-21</b>	<b>-20</b>	<b>-21</b>	<b>-18</b>	<b>-15</b>	<b>-11</b>	<b>-5</b>	<b>-4</b>	<b>-2</b>	<b>2</b>	<b>4</b>	<b>7</b>	<b>10</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>9</b>
GERMANY	01/85-12/02	6.8	<b>-3</b>	<b>-6</b>	<b>-8</b>	<b>-8</b>	<b>-10</b>	<b>-11</b>	<b>-11</b>	<b>-13</b>	<b>-10</b>	<b>-12</b>	<b>-9</b>	<b>-11</b>	<b>-12</b>	<b>-11</b>	<b>-10</b>	<b>-9</b>	<b>-8</b>	<b>-8</b>	<b>-8</b>	<b>-5</b>	<b>-3</b>	<b>-1</b>	<b>0</b>	<b>-2</b>	<b>-3</b>	<b>-3</b>
SWEDEN	01/85-06/02	6.9	<b>-19</b>	<b>-17</b>	<b>-18</b>	<b>-16</b>	<b>-15</b>	<b>-13</b>	<b>-14</b>	<b>-14</b>	<b>-15</b>	<b>-14</b>	<b>-14</b>	<b>-16</b>	<b>-12</b>	<b>-11</b>	<b>-11</b>	<b>-12</b>	<b>-15</b>	<b>-17</b>	<b>-17</b>	<b>-18</b>	<b>-18</b>	<b>-15</b>	<b>-15</b>	<b>-14</b>	<b>-10</b>	<b>-10</b>
HUNGARY	01/85-12/02	6.8	<b>-25</b>	<b>-24</b>	<b>-23</b>	<b>-22</b>	<b>-21</b>	<b>-21</b>	<b>-20</b>	<b>-20</b>	<b>-18</b>	<b>-17</b>	<b>-19</b>	<b>-18</b>	<b>-17</b>	<b>-15</b>	<b>-14</b>	<b>-13</b>	<b>-12</b>	<b>-11</b>	<b>-10</b>	<b>-8</b>	<b>-5</b>	<b>-5</b>	<b>-7</b>	<b>-8</b>	<b>-9</b>	<b>-9</b>
DENMARK	01/85-12/02	6.8	<b>2</b>	<b>-1</b>	<b>-7</b>	<b>-9</b>	<b>-13</b>	<b>-17</b>	<b>-16</b>	<b>-19</b>	<b>-20</b>	<b>-18</b>	<b>-22</b>	<b>-24</b>	<b>-24</b>	<b>-24</b>	<b>-26</b>	<b>-25</b>	<b>-25</b>	<b>-25</b>	<b>-25</b>	<b>-24</b>	<b>-21</b>	<b>-17</b>	<b>-14</b>	<b>-13</b>	<b>-12</b>	<b>-12</b>
IRELAND	01/85-01/03	6.8	<b>-5</b>	<b>-9</b>	<b>-13</b>	<b>-18</b>	<b>-23</b>	<b>-28</b>	<b>-32</b>	<b>-34</b>	<b>-34</b>	<b>-32</b>	<b>-30</b>	<b>-28</b>	<b>-25</b>	<b>-24</b>	<b>-22</b>	<b>-20</b>	<b>-19</b>	<b>-21</b>	<b>-23</b>	<b>-24</b>	<b>-24</b>	<b>-22</b>	<b>-20</b>	<b>-19</b>	<b>-20</b>	<b>-20</b>
SLOVENIA	12/91-02/03	8.6	<b>-8</b>	<b>-10</b>	<b>-15</b>	<b>-20</b>	<b>-24</b>	<b>-28</b>	<b>-28</b>	<b>-28</b>	<b>-28</b>	<b>-28</b>	<b>-28</b>	<b>-28</b>	<b>-29</b>	<b>-30</b>	<b>-31</b>	<b>-29</b>	<b>-28</b>	<b>-26</b>	<b>-24</b>	<b>-24</b>	<b>-21</b>	<b>-19</b>	<b>-16</b>	<b>-13</b>	<b>-10</b>	<b>-10</b>
EURO ZONE	01/98-01/03	12.8	<b>-23</b>	<b>-26</b>	<b>-29</b>	<b>-32</b>	<b>-35</b>	<b>-36</b>	<b>-37</b>	<b>-37</b>	<b>-37</b>	<b>-36</b>	<b>-39</b>	<b>-42</b>	<b>-43</b>	<b>-41</b>	<b>-39</b>	<b>-36</b>	<b>-34</b>	<b>-33</b>	<b>-33</b>	<b>-33</b>	<b>-34</b>	<b>-37</b>	<b>-38</b>	<b>-39</b>	<b>-35</b>	<b>-35</b>

\*Standard deviations are calculated as  $(1/\sqrt{n})$

+ Maximum values (in absolute value) for each row are highlighted as bold and underlined. The names of the current EU member states are written in bold; those of the new member states and the benchmark countries are written in italics and in parentheses, respectively.

### 3. Assessment of the Cyclical Components of Industrial Production Series

This paper looks at whether the Turkish and the EU countries' outputs are synchronized in the short-run. This requires extracting the cyclical component of the industrial production index for each country in our sample. In this section, we first refresh the reader on the stylized properties of economic time series. Secondly, we address the technique employed to compute the cyclical components of the industrial production series in our data set. Our technical discussion largely borrows from Baxter and King (1999).

Time series are composed of the following components: Trend, cyclical movements around the trend, seasonal variations embedded in the series, and random deviations from the sum of these regular components. When we take into consideration, for instance, the real output, we can simply illustrate the meanings of these components. The first one, namely the trend component carries the information on long-run growth tendencies of real output. The cycles in a time series cover time horizons different from a year. The usual business cycles literature mostly builds upon such behavior associated with economic time series, i.e. cycles having periods longer than a year and those non-seasonal ones having periods shorter than a year are attributed to the business cycles. As far as the seasonal movements are considered, real output peaking in summer and reaching a trough in winter every year, might be considered a straightforward example. Finally, the random component can be defined as the associated residual and it can be induced by any kind of shock to the series under consideration.

Based on the theory of spectral analysis of time series data, the height of the spectrum of an economic time series at a certain frequency corresponds to fluctuations of the periodicity that inversely corresponds to that frequency. Therefore, the above-mentioned cyclical component can be thought of as those movements in the series associated with periodicities within a certain range of business cycle fluctuations. Stock and Watson (1999), for instance, define this range of business cycle periodicities to be between six quarters and eight years for the US economy. Their rationale is based on the chronology of the US National Bureau of Economic Research that lists 30 complete cycles since 1858. Among those cycles, the shortest was of six quarters and the longest one last for 39 quarters; with nearly 90% of all cycles last for no longer than 32 quarters. Accordingly, an ideal linear filter is expected to preserve these cyclical movements of a time series yet eliminate the other fluctuations, both the high frequency fluctuations associated with measurement errors and short-duration shocks and the low-frequency fluctuations associated with trend growth in the industrial production series. In this way, the gain<sup>5</sup> of the ideal linear filter is unity, i.e. equal to 1, for business cycle frequencies and zero elsewhere. However, such an ideal filter is not feasible on a finite data set, since it requires an infinite number of past and future values of the examined series.

On the other hand, a feasible, finite-order, filter can be used to approximate the ideal linear filter. The filter due to Baxter and King (1999) is based on a twelve-quarter centered-moving average, where the weights are chosen to minimize the squared difference between the optimal and approximately optimal filters, given the constraint that the filter should have zero gain at frequency zero. It should be noted that, because this is a finite approximation its gain is approximately one within the business cycle band and can be non-zero for some near frequencies outside the specified band. In order to obtain the filtered values at the beginning and end of the sample, the series are augmented by twelve out-of-sample projected values at both ends of the sample, where the projections were made using forecasts and backcasts from univariate fourth-order autoregressive models

5 - Gain function measures the performance of a filter over the frequency domain. Without going into the technical details, it can be defined as the magnitude of the frequency response function. For the discussion of the issue, see Gencay, Selcuk and Whitcher (2002), Chapter 2.

In the literature, the first-differencing filter is a popular and handy device. However, though it eliminates the trend component, it exacerbates the effects of high frequency noise. Hodrick-Prescott (HP) filter can be used as a remedy to avoid this problem. HP filter improves upon the first-differencing filter; i.e. it attenuates less of the cyclical component and it does not amplify the high frequency noise. However, it still passes much of the high frequency noise outside the business cycle frequency band. Consequently, we have employed Baxter and King's (1999) band-pass filter, which mitigates these problems.

Since detailed data regarding the past business cycles on each country in our sample is not readily available, the best remedy of ours to handle the data unavailability problem is to use a common cutoff frequency setup for each country in our sample. Actually, the range of business cycle frequencies can vary from one country to another. We have specified the upper and lower cutoff frequencies as 2 and 96 months respectively. Our choice of the lower cutoff frequency of 96 months is in line with the recommendation by Baxter and King (1999). On the other hand, we specified the upper cutoff frequency as 2 months intentionally, in order to allow for a relatively larger amount of short-term fluctuations.<sup>6</sup> As to the filtering process, two points need to be highlighted. Firstly, we use a monthly equivalent of the quarterly framework of Baxter and King (1999). Secondly, our lower cutoff frequency of 2 months reflects the applicable lowest figure.

After obtaining the business cycle components of our industrial production series, their co-movements are assessed by looking at the cross-correlations. To clarify the procedure, suppose that we have two series,  $x_t$  and  $y_t$ . The correlation between  $x_t$  and  $y_{t+k}$  is the  $k$ -lag cross-correlation between the two series. Following Stock and Watson (1999), we can say that a large positive correlation at  $k=0$  indicates pro-cyclical behavior of series, whereas a large negative correlation at  $k=0$  indicates counter-cyclical behavior. A maximum correlation at  $k=-1$  indicates that the cyclical component of  $x_t$  tends to lag the  $y_t$  by one period. In short, we look at the cross-correlations at  $k=0$  while assessing the pro- or counter-cyclical behavior of data series.

#### **4. Interaction between Turkish and the EU Real Outputs**

This section presents our empirical findings on the short-run relationship between the industrial productions of Turkey and the EU countries. The outline of the section is as follows: First, we present and interpret our cross-correlation estimates using the largest available data spans. Then considering that the three devastating financial crises that Turkey experienced in 1994, 2000, and 2001 might have an impact on those findings, we repeat the same analysis using between-crisis data covering the period between June 1994 and October 2000.<sup>7</sup>

It is important to note that, our statistical effort is to obtain the population parameters of the cross-correlations. In that respect, it is crucial to use a sample that is as large as possible. As one uses smaller samples to obtain the cross-correlations it is quite possible to end up with less efficient measurements. Thus, we employ all available data while computing our cross-correlation figures, first. This time, however, the role of possible structural changes may be underestimated for sake of higher efficiency. For instance, if the crises of Turkey change the examined relationships apparently but we include these in our computations, then we can end up with biased estimates. Our presentation of the cross-correlations without the crises of Turkey also has the common sample sizes.

<sup>6</sup> - Band-pass filtering of our data series, as well as the seasonal adjustment, was carried out using RATS

<sup>7</sup> - In fact, this second exercise is also useful to demonstrate the effects of the sample selection on the estimates.

The cross-correlations of the band-pass filtered industrial productions<sup>8</sup> of Turkey and other countries of interest are presented in Table 3. Following Stock and Watson (1999), we first interpret the contemporaneous correlation between filtered Turkish industrial production and the ones of other countries as reported in column “0”. The column “0” of Table 3 suggests that industrial production of Turkey shows pro-cyclical behavior with the United States, Japan, Belgium, Industrial Countries, Portugal, and Norway. A negative correlation indicates counter-cyclical behavior. Industrial production of Turkey, as suggested by negative cross correlations, shows a counter-cyclical behavior with industrial productions of the Euro Zone, Slovenia, Ireland, Denmark, Hungary, Sweden, Germany, the United Kingdom, Luxembourg, Canada, France, Austria, Czech Republic, Spain, Italy, the Netherlands, Greece, Finland, and Slovakia.

Overall, Table 3 suggests that pro-cyclical behavior is not observed for most of the European countries. Industrial production of Turkey has a positive correlation with only three European countries; Belgium, Portugal, and Norway, where only the first two are members of the European Union. The highest correlation is with Belgium at 12%. For the majority of the European countries this correlation is negative, where thirteen of them are members of the EU and some of the others are forthcoming members. We should emphasize that in Table 3 the relationship between the industrial production of Turkey and that of the Euro Zone is similar to the relationship between Turkey and most of the European countries. This owes support to the robustness and consistency of our empirical findings. There appears a negative cross-correlation between them, which is -43%. This finding suggests that if the EU is in a recessionary gap then Turkey is in an inflationary gap, or vice versa. Consequently, the policies that are going to be implemented in the case of each should be different. This is expected to increase the volatility of Turkish business cycle. However, the monetary policy of the EU is the same for every member country. We think that this can be viewed as an important challenge for Turkish policy makers.

While examining the lead-lag relations reported in Table 3, we will discuss only the cases of Germany, the United Kingdom and the United States<sup>9</sup> in order to save space. The Euro Zone is considered separately, as well. Following Stock and Watson (1999), we interpret the maximum values of the cross-correlations in absolute values as the determinants of the lead-lag relationship between the Turkish and other countries' business cycles. If the maximum absolute value is observed on the left-hand side of the “0” column, this suggests that the corresponding country leads the Turkish industrial production. If the maximum value is observed on the right-hand side of the “0” column, then the Turkish industrial production leads the industrial production of that country. When we look at the values reported in the United States row, we see that the industrial productions of Turkey and the United States are correlated at column “-12” with -27%. This indicates that the industrial production of the US leads that of Turkey by 12 months. As for the results reported in the United Kingdom row, the United Kingdom leads Turkey with -24% by 10 months. Because of the high volume of trade between Turkey and Germany, it is important to assess the lead-lag relationship between them. Table 3 suggests that the industrial production of Germany leads that of Turkey by a correlation coefficient of -13% and 5 months. Finally, we examine the results for the Euro Zone, which is the main interest of this study. According to Table 3, the industrial productions of Turkey and the Euro Zone are contemporaneously counter-cyclical with a correlation coefficient of -43%, since the maximal level appears in “0” column.

8 - All data are taken from International Financial Statistics CD-ROM of the International Monetary Fund. IFS line number is 66 for Austria, Czech Republic, Hungary, Portugal, Slovakia and Turkey; 66.c for Canada, Denmark, the Euro Zone, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Slovenia, Spain, Sweden, the United Kingdom and the United States; 66.b for Belgium, and Luxembourg; 66.i for the IMF's industrial country aggregate and 66ey for Greece. The base year for all industrial production index series is 1995.  
9 - Canada, Japan, the United States and the IMF's Industrial Country aggregate are included in this paper in addition to current EU states and candidate countries, because they can be viewed as natural benchmarks for our correlation measures.

**Table 4**  
**Cross Correlations with Industrial Productions of Turkey and Other Countries Excluding the Crises of Turkey.+**

COUNTRY/REGION	PERIOD	St. Dv. <sup>a</sup>	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12
(UNITED STATES)	06/94-10/00	11.3	-2	3	7	12	16	21	26	31	36	40	45	50	53	52	50	49	46	46	45	48	51	53	56	57	58
(IND. COUNTRIES)	06/94-10/00	11.3	-8	-3	0	3	5	7	9	12	16	18	21	23	<b>23</b>	17	12	7	2	-1	-3	-2	-1	0	4	7	11
BELGIUM	06/94-10/00	11.3	7	11	13	8	16	14	13	21	17	23	22	22	21	21	2	4	3	-5	-4	-16	-14	-11	-16	-9	
THE NETHERLANDS	06/94-10/00	11.3	4	7	9	4	6	7	8	13	13	14	19	17	12	6	-1	0	6	-4	-3	-5	-9	-7	-11	-13	
(JAPAN)	06/94-10/00	11.3	13	16	18	20	19	18	18	18	19	18	19	18	17	9	4	-3	-8	-14	-16	-19	-23	<b>25</b>	-23	-21	-19
LUXEMBOURG	06/94-10/00	11.3	-10	-11	-5	-4	4	4	11	8	14	13	16	16	17	17	20	19	10	18	19	19	15	15	15	14	
(NORWAY)	06/94-10/00	11.3	5	8	9	10	11	10	12	12	10	8	8	10	15	7	-7	-14	-17	-16	-19	-22	-29	-31	<b>33</b>	-32	
FRANCE	06/94-10/00	11.3	-26	-22	-21	-18	-13	-10	-6	-3	-2	2	4	8	9	6	8	9	12	12	15	20	24	26	30	30	<b>35</b>
GERMANY	06/94-10/00	11.3	-21	-18	-16	-12	-10	-9	-5	-2	2	5	8	9	9	8	4	2	0	2	5	12	12	15	18	19	<b>23</b>
SPAIN	06/94-10/00	11.3	-26	-24	-22	-18	-11	-7	-3	-1	1	4	6	7	6	3	3	5	3	2	3	9	17	21	24	27	<b>35</b>
EURO ZONE	01/98-10/00	17.2	34	37	35	34	32	31	35	34	32	22	13	3	3	-9	-18	-28	-38	-49	-56	-61	-61	<b>65</b>	-60	-57	-49
SLOVAKIA	06/94-10/00	11.3	-2	-3	-4	-3	1	4	4	5	5	4	4	4	3	1	-3	-5	-9	-17	-23	-26	-31	-38	-45	-52	<b>55</b>
GREECE	06/94-10/00	11.3	-11	-14	-14	-17	-14	-10	-5	0	0	3	6	2	1	1	1	0	4	1	4	0	4	3	-2	-11	-14
HUNGARY	06/94-10/00	11.3	<b>33</b>	-29	-27	-26	-22	-20	-17	-13	-11	-9	-6	-3	1	1	-2	-1	1	-1	0	0	3	7	13	16	22
FINLAND	06/94-10/00	11.3	<b>32</b>	-32	-29	-27	-24	-22	-18	-14	-12	-9	-6	-4	0	-2	-3	-4	-3	2	5	7	12	15	21	24	26
PORTUGAL	06/94-10/00	11.3	-1	-2	0	5	4	2	3	2	3	4	1	0	0	0	5	-2	-2	-3	-2	-3	-2	-3	2	-1	0
AUSTRIA	06/94-10/00	11.3	-20	-17	-18	-19	-17	-15	-14	-12	-12	-8	-7	-5	-4	-9	-12	-14	-18	-21	-27	<b>34</b>	-25	-19	-14	-8	-2
SWEDEN	06/94-10/00	11.3	-24	-22	-21	-19	-20	-19	-18	-17	-12	-10	-11	-11	-9	-15	-19	-28	-29	-32	<b>33</b>	-33	-31	-27	-22	-12	-10
DENMARK	06/94-10/00	11.3	-16	-13	-12	-11	-11	-16	-16	-10	-11	-9	-8	-7	-10	-12	-12	-12	-12	-17	-23	<b>25</b>	-23	-21	-17	-11	-7
(CANADA)	06/94-10/00	11.3	<b>30</b>	-29	-27	-25	-22	-20	-19	-18	-18	-18	-17	-16	-14	-14	-15	-15	-16	-14	-10	-3	4	11	17	24	
ITALY	06/94-10/00	11.3	-27	-25	-26	-26	-22	-20	-18	-13	-12	-14	-14	-14	-12	-15	-19	-20	-18	-21	-28	-32	-29	-31	-34	-31	<b>35</b>
CZECH REPUBLIC	06/94-10/00	11.3	-8	-8	-8	-11	-12	-13	-16	-16	-16	-16	-16	-15	-15	-15	-19	-20	-21	-27	-32	-35	-38	-41	-44	-48	<b>49</b>
UNITED KINGDOM	06/94-10/00	11.3	-28	-27	-27	-29	-29	-30	-30	-28	-25	-24	-23	-23	-23	-26	-30	<b>31</b>	-27	-25	-21	-15	-12	-9	-3	2	6
SLOVENIA	06/94-10/00	11.3	<b>34</b>	-33	-32	-32	-30	-28	-27	-28	-29	-30	-30	-30	-32	-31	-30	-27	-26	-26	-26	-27	-25	-21	-15	-13	-10
IRELAND	06/94-10/00	11.3	-20	-24	-28	-32	-37	-41	-44	-45	-45	-45	-45	-46	-45	-45	-45	-44	-43	-43	-43	-43	-43	-42	-41	-39	-38

\*Standard deviations are calculated as  $(1/\sqrt{\pi})$

+ Maximum values (in absolute value) for each row are highlighted with bold and underline. The names of the current EU member states are written in **bold**; those of the new member states and the benchmark countries are written in *italics* and in parentheses, respectively.

industrial productions of most of the European countries. Moreover, there is a contemporaneously counter-cyclical behavior between the industrial productions of Turkey and the Euro Zone, which augments the above statement. Consequently, the economic integration of Turkey to the EU seems to generate some problems in the short-to-medium run, due to these counter-cyclical connections.

A short glance at recent Turkish economy will reveal three devastating financial crises, namely those of the April 1994, November 2000 and February 2001. These crises had adverse impacts on the financial and real dynamics of the Turkish economy. Hence, one may always be suspicious about our findings reported above. We think that these crises can drive the results of the cross-correlations among the industrial production of Turkey and other countries, since they are data outliers. This motivated us to repeat the exercise of Table 3, in which we have not included the data for the crises periods of Turkey, in that we have not considered the time period before April 1994 and November 2000. The results of this exercise are presented in Table 4.<sup>10</sup>

The comparison of Tables 3 and 4 suggests that there are apparent changes in our results. If we look at the “0” column of Table 4, we see that there are more countries in the “0” column than that of Table 3 having contemporaneously pro-cyclical behavior with Turkey. While the United States, Japan, Belgium, Industrial Countries, Portugal, and Norway keeping their pro-cyclical behaviors, the Netherlands, Luxembourg, France, Germany, Spain, the Euro Zone, Slovakia, Greece, Hungary and Finland are added to these countries. The countries that continue having contemporaneously counter-cyclical behavior are Austria, Sweden, Denmark, Canada, Italy, Czech Republic, the United Kingdom, Slovenia and Ireland.

To check for the differences between the two tables according to the lead-lag relationships, we observe that some of the results stay unchanged, where some of them change. For example, the maximum value for the industrial production of the United States row appears in “12” column of Table 4, which appears in “-12” column of Table 3. Moreover, the sign of the value and lead-lag relationship between the industrial productions of Turkey and the United States also change with an increase in the percentage. When we look at the Euro Zone row, the relationship between the industrial productions remains in line with that reported in Table 3. However, in Table 3 the maximum level appears in “0” column where in Table 4 it appears in column “9”, which states that the industrial production of Turkey leads the industrial production of the Euro Zone by 9 months with a correlation coefficient of -65%. The most drastic change occurs in the results for the Czech Republic. In Table 3, it is reported that the Turkish business cycle lags that of the Czech Republic by 12 months with a 45% correlation. However, Table 4 suggests that, without the crises of Turkey, industrial production of Turkey leads that of the Czech Republic by 12 months. Examining the cross-correlation results of the industrial productions of Turkey and Germany, we see that in Table 3 the industrial production of Germany leads that of Turkey by 5 months. Without the crises, this relationship changes to a relationship in which the industrial production of Turkey leads the industrial production of Germany with 23% correlation and by 12 months. The interested reader may elaborate on the results that we do not cover here.

<sup>10</sup> - This exercise also helps demonstrating the effects of using a common sample, rather than an unbalanced one as we have done in Table 3, while computing and assessing the cross-correlations.

Based on Table 3 and Table 4, we can consolidate our findings such that, when we include the crises data for Turkey, the industrial production of Turkey seems to be counter-cyclically related to those of 18 European countries. These countries are Slovakia, Finland, Greece, the Netherlands, Italy, Spain, Czech Republic, Austria, France, Luxembourg, the United Kingdom, Germany, Sweden, Hungary, Denmark, Ireland, Slovenia and Euro Zone. Among these, 13 are the current member states. On the other hand, without the crises data this number drops to 8, namely Austria, Sweden, Denmark, Italy, Czech Republic, the United Kingdom, Slovenia and Ireland, 6 of which are current member states. These differences between Table 3 and Table 4 have the following interpretations: Firstly, the cross-correlation estimates are sensitive to Turkey's crises. Second, when crises data are dropped the industrial production of Turkey is pro-cyclically linked to that of the Euro Zone. These findings suggest that financial crises affect the direction of the examined relationships. Therefore, crisis prevention and policies that enhance macroeconomic stability becomes more crucial for the synchronization of the business cycles of Turkish and the European economies. Such policies can contribute Turkish economy to smoothly adapt to its European counterparts.

### **5. Concluding Remarks**

In this paper, we tried to find some empirical evidence for the possibility of economic integration of Turkey to the EU in the short term. We used the industrial productions of Turkey and other countries, and computed the cross-correlations of cyclical components of these.

First, we have investigated the relationships using whole data set. Then, we have extended the analysis by using non-crises data in order to avoid the possibility that the crises could have driven our results. Including the crises, the relationship between Turkish and the European business cycles appeared to be counter-cyclical which may suggest adaptation of Turkey to the EU would be difficult in the short-term. This is because, if the cross-correlations are such that the business cycles of Turkey and the EU countries are counter-cyclical, when Turkey has a recessionary gap, other countries have inflationary gaps, or vice versa, and these situations necessitate different economic policies under normal circumstances. However, some of the economic policies like the monetary policies of the EU cannot be changed arbitrarily according to a single member country. Overall, this seems as an important source of problems for the accession period.

On the other hand, without the crises the relationship changes to almost pro-cyclical. This suggests that financial crises affect the direction of the examined relationships significantly. During the non-crises episodes the above-mentioned potential problems of synchronization do not occur. Therefore, crisis prevention and policies that enhance macroeconomic stability becomes more crucial for the synchronization of the business cycles of Turkish and the European economies. Such policies can contribute Turkish economy to smoothly adapt to its European counterparts.

Some caveats regarding the current study might address three issues: First, if a country is integrating through a structural change then our framework will not reveal the change. Secondly, lack of a pro-cyclical relationship in the past does not imply a lack in the future, i.e. all the examined relationships may change dynamically. Finally, one may extend the current analysis to sub-sectors, especially those produce the tradable commodities.

## References

- Baxter, M. and R.G. King. 1999. "Measuring Business Cycles Approximate Band-Pass Filters for Economic Time Series". **Review of Economics and Statistics** 81, issue 4, 575-93.
- Berument, M.H., N.K. Malatyali and B. Neyapti, 2001. "Turkey's Full Membership to the European Union". **Russian and East European Finance and Trade**, vol. 37, no. 4, p.50-60.
- European Union, 2002. **General Report on the Activities of the European Union 2002**. <http://europa.eu.int/abc/doc/off/rg/en/2002>
- Gencay, R., F. Selcuk and B. Whitcher. 2002. **An Introduction to Wavelets and Other Filtering Methods in Finance and Economics**. Academic Press. New York.
- Malatyali, K. 1998. "Possible Effects of European Monetary Union on Turkey" [in Turkish]. Mimeo. **State Planning Organization (SPO)**, Ankara.
- Sahin, R. 1998. "Budget and Funds of European Union and the Full Membership of Turkey" [in Turkish]. **State Planning Organization (SPO)**, Ankara.
- State Planning Organization, (SPO)**. 1999. "Estimated Spending from the EU Budget for the Years 2000-2006." Mimeo. Ankara.
- Stock, J.H. and M.W. Watson, 1999. "Business Cycle Fluctuations in US Macroeconomic Time Series", in Taylor, J.B. and M. Woodford, **Handbook of Macroeconomics Volume 1A**, Elsevier Publishing, Amsterdam.
- TOBB, 2003. "EU Regional Policies and Structural Funds: An Evaluation of the case of Turkey", (**AB Bölgesel Politikası ve Yapısal Fonlar: Türkiye Açısından Değerlendirme**). TOBB7AB Directorate.